MODIS Light

Option for Low-Risk EOS Cost Reduction

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Hughes Santa Barbara Remote Sensing

HUGHES
AIRCRAFT

MODIS Light Lowers Cost Minimizes Risks

SANTA BARBARA REMOTE SENSING
HUGHES AIRCRAFT

- Reduce Spacecraft Resources and Launch Mass
  - Delete less critical subsystems (e.g., SRCA)
  - Reduce Scan (±45°) and Aperture (6")
  - Repackage to Cut Mass & Volume
  - Reduced Electronics Lowers Power

- Reduce Instrument Recurring Engineering (RE) and Non-RE (NRE) Costs
  - Maximum use of Existing Flight Subsystems cuts NRE
  - Maximum use of Existing Ground Equipment cuts NRE
  - Streamlined Documentation/Manufacturing Process cuts Both

- High Performance and Low Risk
  - 36 MODIS Bands with same IFOVs/Spectral Definition
  - Solar Diffuser/Blackbody Calibration
  - Minimal Impact to MODIS Processing Algorithms

MODIS to MODIS Light

SANTA BARBARA REMOTE SENSING
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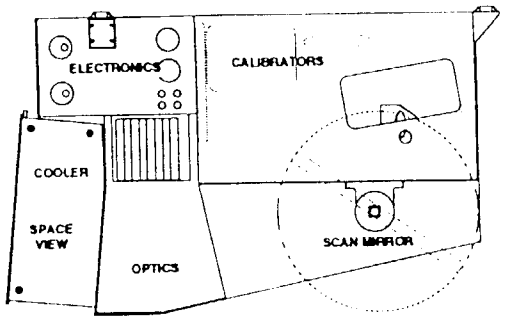
Baseline

• Mass	220 kg
• Size	1x1.6x1m
• Power	160W
• Cost	No NRE
• Bands	36

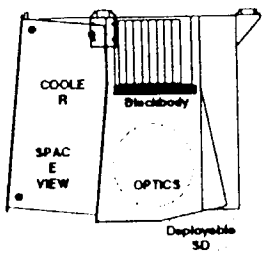
Calibration
- SRCA
- SDSM
- SD
- BB

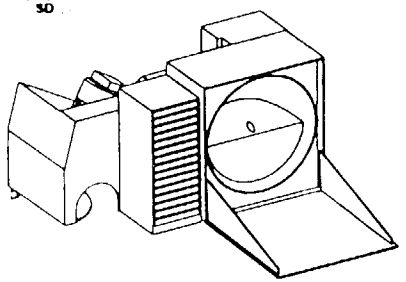


Smaller Scanner
Reduced Calibration
Smaller Mainframe
Repackaged Electronics

• Mass	100 kg
• Volume	1x0.6x0.7m
• Power	100W
• Cost	Low NRE
• Bands	36

Calibration
- SD
- BB





MODIS Light - Baseline Scan Approach

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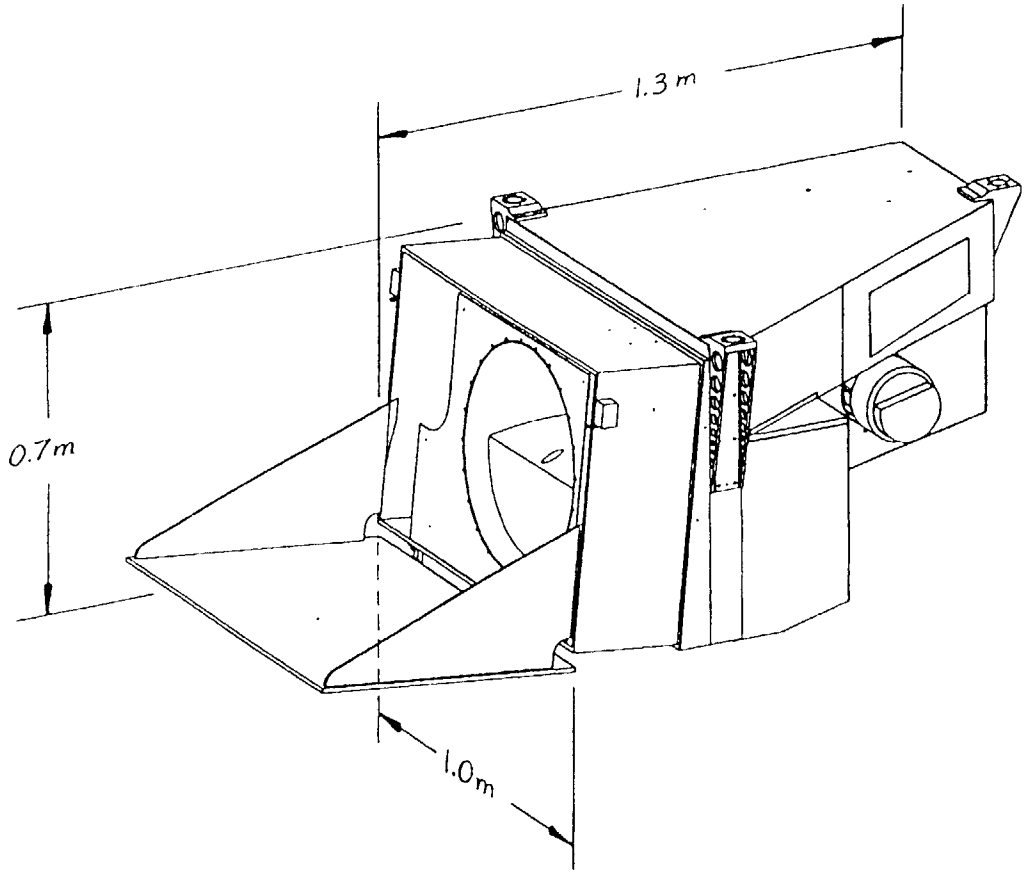
HUGHES AIRCRAFT



- Larger than MODIS Light with Tilted Scan
- Baseline Swath Shape and Optical Path

Design Approach Affects Performance

SANTA BARBARA REMOTE SENSING — HUGHES AIRCRAFT

Parameter	Selected MODIS Design (Including MODIS Light)	Other Approaches Considered*
Radiometric		
Stray Light	•Low with 2d Int. Stop	• Field Stop Limited to 1d
Calibration	• Allows Frequent Calibration • Small Calibration Target	• Calibration Obstructs Scene; 1/f noise • Requires Large, Uniform Target
Tunability**	• Individual Array per Band	• Bands share Detectors: Hi Gain Appls Penalized
Spectral		
Bandpass Shape Purity	• Tailored Band-shapes • Individual Filters fed by Distributed Blocking	• Requires Band Synthesis • More Difficult to Maintain Constant Center λ across FOV; Difficult Out-of-Band Rejection
Spatial Uniformity	• Full-Field Uniformity • Few Detectors Eases Calibration	• WFOV Edge Distortion • More difficult Calibration

* Narrow/Wide FOV Spectrometers using Gratings, Prisms, or Wedge Filters

**MODIS has multiple similar bands with Application Specific Radiometry

Summary

SANTA BARBARA REMOTE SENSING
HUGHES AIRCRAFT

- Straightforward Repackaging Offers Significant Reduction in Mass and Volume
- Reduces Instrument Cost: Low NRE and RE MODIS Miniaturization Approach
- Maximizes MODIS Data Continuity: Minimal Impact to MODIS Processing Algorithms
- Preserves *Optical Bench Assembly* "Heart of MODIS" that Retains MODIS Spectroradiometry